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Title:

SYSTEM AND METHOD FOR DE-SKEWING MEDIA WHEN USING AN AUTOMATIC MEDIA FEEDER

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SYSTEM AND METHOD FOR DE-SKEWING MEDIA WHEN USING AN AUTOMATIC MEDIA FEEDER

BACKGROUND

[0001] It is common today for imaging and printing devices to employ automated means for feeding media to be scanned or printed. For example, automatic document feeders (ADFs) have been used with respect to printers and optical scanners for a number of years to facilitate the automated handling of a plurality of documents serially, such as for scanning or printing images. Such ADFs typically provide a configuration in which an image surface of the media being imaged is never fully in view to the device (i.e., only a small portion of a medium is exposed to a print head or an optical array at any point in time with the remainder of the medium being engaged by the ADF mechanism).

[0002] For example, ADFs in scanner implementations often implement a "C-shaped" feed path in which an optical array is disposed approximately at the middle of the outer edge of the "C-shaped" feed path. As a medium is moved through the "C-shaped" feed path, the optical array may be exposed to an image surface of the medium over time. Such ADF configurations have been found to work adequately with respect to typical paper stock, such as 20# bond paper, but are typically unacceptable for use with other media, such as photo stock or photographic media. Photographic media, for example, is generally more rigid than typical paper stock. Moreover, photographic media is prone to surface scratching, which can seriously degrade the quality of the image thereon. Further, the thick and rigid nature of the photographic media results in jams and misfeeds, and the photographic image surface results in increased friction when in contact with surfaces (particularly in high humidity environments). Photographic media has been discovered to suffer from less surface scratching when held with an image surface thereof fully or substantially fully exposed to a passing imaging mechanism, for example, by laying the image surface against a transparent platen for a traditional scan pass. Unfortunately, the aforementioned ADFs do not accommodate such a technique in an automated fashion.

[0003] Accordingly, ADFs that are well suited for use with respect to photographic media and similar stock have heretofore not been widely available. A further requirement for suitable automated document handling with respect to photographic media is that, not only should the mechanism be adapted to accommodate the relatively rigid nature of the stock without

introducing surface scratches on the media, the mechanism should ensure that the photographic media will be square to the optical carriage or other imaging apparatus.

SUMMARY

[0004] A system for de-skewing media when using an automatic media feeder, the system comprising, a registration guide, and a registration tab disposed to deflect an edge of the media toward the registration guide when the media passes over the registration tab.

[0005] A method for de-skewing media when using an automatic media feeder comprising disposing a registration tab to cooperate with a registration guide in providing de-skewing of media, translating the media in a first direction to pass a first edge of the media by the registration tab, deflecting with the registration tab the first edge toward the registration guide, and continuing to apply a translation force to the media after at least a portion of the first edge engages the registration guide, thereby de-skewing the media.

[0006] An automatic photograph feeder comprising, a photographic media input tray, a media singulator disposed to draw photographic media from the input tray and introduce the media in an imaging area of a host system, a registration tab, and a media translation mechanism disposed to accept the photographic media from the singulator and to cause an edge of the media to engage the registration tab, wherein engaging the registration tab by the edge causes the edge to deflect towards a registration guide.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIGURES 1A and 1B show one embodiment of an automatic photograph feeder configured according to the present invention;

[0008] FIGURES 2A-2D show operation of an automatic photograph feeder according to an embodiment of the invention;

[0009] FIGURE 3 shows detail with respect to one embodiment of a tab utilized in media registration; and

[0010] FIGURES 4A-4C show detail with respect to an alternative embodiment of a tab utilized in media registration.

DETAILED DESCRIPTION

[0011] Embodiments of the present invention provide an automatic photograph feeder (APF) configuration that is adapted to draw one piece of photographic media at a time from a queue and to place the photographic media with an image surface thereof fully or substantially fully exposed to a passing imaging mechanism. Registration of such media (i.e., placing the media in correspondence or alignment with a reference) for imaging is addressed according to embodiments of the present invention using registration guides that require a minimum number of parts. In particular configurations, the registration guides comprise inexpensive to manufacture and install non-moving parts. Accordingly, APFs configured according to the present invention provide automated media handling for imaging functions that are adapted both to handle the relatively thick and rigid attributes of photographic media and to avoid or minimize scratching or other degradation of the image surface.

[0012] Although embodiments are described herein with reference to photographic media and APF configurations, the concepts of the present invention are not limited to use with respect to photographic media. Accordingly, embodiments of the present invention may be utilized in providing automated handling of any of a number of media types, including common paper stock.

[0013] FIGURES 1A and 1B illustrates one embodiment of an APF configured according to the present invention. As shown in FIGURE 1A, scanner 100 includes lid 105 and transparent platen 104, such that a document may be placed against platen 104 and optical carriage 101 moved past to allow optical array 103 to capture an image of the document illuminated by lamp 102. APF 150 facilitates automated handling of media into and out of the imaging area of scanner 100.

[0014] APF 150 of the illustrated embodiment is disposed in lid 105 of scanner 100. APF 150 includes document singulator and take-up mechanism 151, such as may comprise a rubberized take-up roller, to move documents 110 from input tray 152 through feed slot 153 into an imaging area associated with platen 104. Feed belts 154 are disposed to provide controlled movement of documents in the imaging area of scanner 100. For example, vacuum orifices 156 (FIGURE 1B) may provide a reduced pressure area next to lid 105 to draw media in the imaging area of scanner 100 towards lid 105, thereby cooperating with feed belts 154 to provide controlled movement of documents in the imaging area of scanner 100. Tabs 155 are

disposed to provide registration of media handled by APF 150. Specifically, tabs 155 of preferred embodiments cooperate with registration guide 106 formed along an edge of platen 104 to square (align or place in correspondence) media fed by APF 150 with an imaging mechanism, such as optical array 103 of scanner 100. Registration guide 106 may be present in the scanner configuration to provide assistance in manual registration of media, the use of which is leveraged according to embodiments of the present invention.

[0015] FIGURES 2A-2D illustrate the operation of APF 150 in providing automated handling of photographic media for scanning according to one embodiment. In operation, singulator and take-up mechanism 151 draws a next document (here document 110a) of documents 110 from the queue of documents in input tray 152 into an imaging area of scanner 100 between lid 105 and platen 104, as shown in FIGURE 2A. Input tray 152 is preferably disposed at a slight angle with respect to the plane of lid 105 and platen 104, such as on the order of 5°. Accordingly, as a leading edge of document 110a is brought into the imaging area of scanner 100, the leading edge easily passes tabs 155, without catching thereon. Of course, lesser input feed angles may be supported by embodiments of the present invention, even 0°, by properly adapting tabs 155. For example, tabs 155 may be provided in a configuration that retracts when pressure is applied from one direction, but remain extended from another direction, to accommodate a particular input feed angle. Additionally or alternatively, tabs 155 may incorporate ramped or sloped surfaces, as shown in the embodiment of FIGURES 2A-2D, to assist the leading edge of the medium to pass the tabs without catching thereon.

[0016] In the embodiment of FIGURES 2A-2D, document 110a is fed sufficiently far into the imaging area of scanner 100 by singulator and take-up mechanism 151 for feed belts 154 to engage the document, as shown in FIGURE 2B. Initially, feed belts 154 are feeding in a same direction, and providing a similar rate of translation, as singulator and take-up mechanism 151 to facilitate a transition from document 110a being propelled by singulator and take-up mechanism 151 to document 110a being propelled by belts 154.

[0017] In the illustrated embodiment, a reduced pressure area between document 110a and lid 105, such as may be created using vacuum orifices 156 (FIGURE 1B), is employed to assist feed belts 154 engagement of the surface of document 110a. Of course, other techniques for assuring that feed belts 154, or any other translation mechanism, reliably engage media may be employed. For example, the orientation of scanner 100 may be inverted from that

illustrated in FIGURES 2A and 2B such that lid 105 is beneath document 110a when in the imaging area of scanner 100. In such a configuration, gravity may be relied upon to assist feed belts 154 engage a surface of document 110a. Additionally or alternatively, the space between feed belts 154 and platen 104 may be reduced such that a surface of document 110a engages platen 104 while another surface of document 110a engages feed belts 154, thereby providing a configuration in which platen 104 assists feed belts 154 engagement of a surface of document 110a. However, this latter technique may not be preferred where document 110a comprises photographic media. Specifically, photographic media has been found to experience undesirable levels of friction when a surface thereof is slid along another relatively smooth surface, such as the transparent surface of platen 104, particularly in high humidity conditions. Moreover, the sliding of the image surface of photographic media over another surface is preferably minimized to reduce scratching on the image surface. Accordingly, preferred embodiments of the present invention are adapted to minimize sliding contact between an image surface of the media and other surfaces, such as platen 104.

[0018] After feed belts 154 have propelled a trailing edge of document 110a past tabs 155, the direction of travel is preferably reversed, as shown in FIGURE 2C. Accordingly, the now leading edge (formerly trailing edge) of document 110a is again brought into the area of tabs 155. However, the now leading edge of document 110a this time engages a surface of tabs 155 and is deflected in the direction of platen 104. As feed belts 154 continue to propel document 110a in this reverse direction the now leading edge of document 110a engages registration guide 106, formed along an edge of platen 104, to square document 110a with optical array 103, as shown in FIGURE 2D. Specifically, if the now leading edge of document 110a was askew from the take-up and feed process, as this edge comes into contact with registration guide 106, the length of the edge of the document is flushed against the registration guide, thereby providing a document which is squared with the mechanisms of scanner 100.

[0019] Document 110a may be held in place while an imaging function is performed. For example, optical carriage 101 may traverse the length of document 110a to allow optical array 103 to capture an image thereof as illuminated by lamp 102. The tabs of the illustrated embodiment are obscured from view of the imaging function by the body of document 110a. Accordingly, no image processing need be implemented with respect to the present invention's use of such tabs to prevent their impacting an imaging function. For example, in a

scanning operation, no subsequent image cropping or alteration is required to address the automated media handling mechanism.

[0020] After such an imaging function, feed belts 154 preferably resume operation in their initial direction of travel to propel document 110a away from registration guide 106 and out of the imaging area of scanner 100. Thereafter, the above process may be repeated by singulator and take-up mechanism 151 feeding a next document of documents 110 into the imaging area of scanner 100.

[0021] The illustration of FIGURE 2D shows an exaggerated rendition of the planar distortion of document 110a when engaging tabs 155 and registration guide 106 to more readily convey the concepts herein. Embodiments of the present invention are expected to employ relatively small distances, e.g., tabs 155 may be less than 5 millimeters, perhaps 2-3 millimeters, and the space between lid 105 and platen 104 on the order of 5 millimeters in a scanner implementation of the present invention. Accordingly, appreciably less surface distortion would be experienced in such an embodiment than is illustrated in the figures.

[0022] However, there is expected to be some planar distortion with respect to media positioned for imaging functions according to embodiments of the present invention. It is expected that the focal depth of typical scanners will sufficiently accommodate any such planar distortion. In cases where such planar distortion is undesirable, embodiments of the present invention may be adapted to minimize planar distortion, such as by disengaging a reduced pressure which holds document 110a against lid 105 and thereby allows the media to fall against platen 104. The reduced pressure may again be applied after an imaging function to facilitate feed belts 154 again engaging the media for its removal from the imaging area.

[0023] Registration of automatically handled documents according to embodiments of the present invention employs inexpensive components, as well as aspects of the imaging system otherwise already available. For example, the embodiment of the figures described in detail above utilizes registration guide 106 formed by the interface of platen 104 and the case of scanner 100.

[0024] Moreover, embodiments of tabs 155 may be manufactured very easily and with little added cost. For example, tabs 155 may be cast of the same material (e.g., plastics, resins, polymers, and/or the like) and in the same forming process (e.g., injection molding) as is

lid 105, thereby providing a monolithic member of the lid. Accordingly, non-movable tab configurations may be easily incorporated into a scanner design.

[0025] Tabs 155 of the embodiment illustrated in FIGURES 2A-2D comprise a triangular shape presenting relatively smooth surfaces where it is expected media will engage the tabs. Specifically, tabs 155 of the illustrated embodiment include a first smooth edge tapering away from the plane of lid 105 to facilitate media passing tabs 155 as the media is singulated and brought into an imaging area. Tabs 155 of the illustrated embodiment further include a second smooth edge tapering away from the plane of lid 105 the plane of lid 105 to facilitate media being deflected by tabs 155 toward platen 104 as the media is moved toward a registration position. The illustrated embodiment provides a relatively gentle slope with respect to the taper of the first smooth edge (document in-take edge) to minimize document input resistance associated with tabs 155, and a relatively acute slope with respect to the taper of the second smooth edge (document registration deflection edge) to ensure that the media is sufficiently deflected to engage registration guide 106.

[0026] Of course, configurations of tabs utilized according to the present invention may take shapes or otherwise be configured different than illustrated in FIGURES 2A-2D. For example, embodiments may present a gentler slope (slope of edge 301) to the forward feed direction (document in-take) and a more acute slope (slope of edge 302) to the reverse feed direction (document registration), as shown with respect to tab 355 in FIGURE 3. Alternatively, embodiments may present a sloped surface only with respect to the reverse feed direction (document registration), and rely upon an input angle of the media to avoid interfacing with a forward feed direction (document in-take) edge, such as may be perpendicular to the plane of lid 104.

[0027] The surfaces of tabs utilized according to embodiments of the present invention are not limited to relatively straight or flat surfaces. Accordingly, a tab edge disposed to be presented in a document in-take direction according to embodiments can take any shape suitable for allowing media to pass easily. Likewise, a tab edge disposed to be presented in a document registration direction according to embodiments can take any shape suitable for sufficiently deflecting media for engaging a registration guide. Embodiments of the present invention may implement curvilinear surfaces, for example. According to one embodiment a hemispherical tab shape is implemented.

[0028] Additionally or alternatively, embodiments of the invention may implement movable tabs, such as to facilitate a document passing over the tabs in the forward feed direction and/or to retract the tabs after registration to minimize planar distortion. Directing attention to FIGURES 4A-4C, tab 455 is adapted to move about pivot 410. The placement of pivot 410 is intended to be exemplary and, therefore, a variety of pivoting configurations may be implemented according to embodiments of the invention. As document 110a is fed past tab 455 in the forward feed direction, tab 455 is allowed to swing up and out of the path of document 110a. After document 110a has passed tab 455, the tab again moves about pivot 410 to again descend below lid 105. As the direction of document 110a is reversed for registration, latch 420 engages tab 455 to prevent its moving about pivot 410. Accordingly, as document 110a is reversed into tab 455, the edge thereof deflects the document toward the platen, substantially as discussed above.

[0029] Even when employing moving parts, as in the embodiment of FIGURES 4A-4C, embodiments of the present invention provide a relatively inexpensive solution to registering a document, utilizing relatively few parts. Specifically, as the registration guide of the device is relied upon by these embodiments, the tabs and associated components need not be precision manufactured or composed of particularly structurally stable parts. Moreover, mechanisms, such as the above mentioned latches, may be readily manipulated using systems deployed for other uses, such as utilizing the reversing of feed belts 104 to engage/disengage latch 420.

[0030] Although embodiments have been described herein with reference to tabs that present a relatively thin endwise profile, there is no limitation to such a configuration according to the present invention. For example, embodiments of the invention may implement tabs which are considerably thicker than those illustrated in FIGURE 1B, such as may occupy substantially the entire space between adjacent ones of belts 154. Alternatively, a tab of the present invention may be provided in a configuration which runs substantially the length of a leading edge of media to interface therewith, such as where belts 154 are disposed to run under the tab or where belts 154 are not utilized. Although such thicker tab embodiments may present a tab configuration which is less likely to suffer from damage or removal from rough handling, thinner tab configurations may be more desirable with respect to many implementations due to their decreased cost of material and/or decreased surface area engaging the media.